

several sizes of studs or locating rings are to be used, they must be so arranged that chips and dirt will not interfere with the proper location of the work. They must also be placed so that they can be easily replaced or removed.

7. The adjustments which are necessary to provide for handling various sizes of work should be carefully studied, and suitable provision should be made so that the changes from one setting to another will always be uniform, and variations in the work cannot occur due to errors in adjustment. If necessary, setting gages can be made for the various pieces to be handled, or a separate set of screws or other adjustable locating members can be made for each piece and properly stamped to avoid mistakes. The nature of the work has a great deal to do with the method used to secure uniform adjustments, and specific cases will be noted in following paragraphs.

8. Convenience and rapidity of operation should be given consideration, and provision should be made for setting up the work in as short a time as possible. The fixture should be so arranged that the work can only be set up in the correct way, and it should be as nearly "fool-proof" as possible.

9. The cost of the fixture should be kept down to the lowest figure that is consistent with good design, because the number of pieces to be machined is comparatively small. If the work for which the fixture is made is of such a nature that it is not likely to be changed, a little more latitude is permissible; but as changes in design are always possible, it is advisable not to make an elaborate fixture.

10. The safety of the operator should always be considered,

and projecting lugs, set-screws, or other parts which might catch in his clothing should be eliminated from the design.

Other points in design not mentioned in the foregoing will be specifically mentioned throughout this chapter; comments will be made, and faulty points criticized and discussed.

The three- or four-jawed chuck is perhaps the most frequently used of all the holding devices which are adjustable to take various sizes of work. There are also collets of numerous kinds, which are adjustable within certain limits, and step